PATENT SPECIFICATION

Application Date: Sept. 23, 1943. No. 15620/43. 570,755

Complete Specification Left: Sept. 25, 1944.

Complete Specification Accepted: July 20 19

ERRATA

SPECIFICATION No. 570,755.

Page 5, line 56, *for* " (" *read* ") "
Page 6, line 5, *for* " engagings wheel " *read* " engaging driving wheel "
Page 6, lines 13—14, *for* " communication " *read* " communi-cating "

THE PATENT OFFICE,
25th February, 1946.

rotary hoe that can be easily manipulated detachably coupling the two shafts

ERRATA

SPECIFICATION No. 570,755.

Page 5, line 56, *for* " (" *read* ") "
Page 5, line 87, *after* " engaging " *insert* " driving "
Page 6, line 5, *for* " engagings wheels " *read* " engaging driving wheels "
Page 6, lines 13—14, *for* " communication " *read* " communi-cating "

THE PATENT OFFICE,
October 21st, 1946.

plant and the operator.

The supporting wheel or wheels, is preferably attached to the control beam in such a manner that it can be raised or lowered when the depth control setting of the driving wheel or wheels is changed so as to enable the control beam to be maintained at a convenient angle for operating the machine. The supporting

shafts, and carries a driving wheel on a stub shaft disposed forwardly of said drive shafts. The driving wheels have peripheral projections for gripping the ground and are provided with an internal gear ring engaged by pinions held on the driving wheel drive shaft by nuts. In this way the driving wheels and the rotor are driven in the same sense

PATENT SPECIFICATION

Application Date: Sept. 23, 1943. No. 15620/43. **570,755**

Complete Specification Left: Sept. 25, 1944.

Complete Specification Accepted: July 20, 1945.

PROVISIONAL SPECIFICATION

Improvements in and relating to Portable Rotary Hoes

We, ARTHUR CLIFFORD HOWARD, of 9, Stewart Avenue, Upminster, in the County of Essex, a British Subject, and ROTARY HOES LIMITED, a British Company, of Station Road, East Horndon, Essex, do hereby declare the nature of this invention to be as follows:—

This invention relates to rotary hoes and has for one of its objects to provide a portable power-operated machine particularly adapted for use in greenhouses.

A further object of this invention is to provide such a machine that is adapted for electrical operation from a supply main or a portable generating set, or by an engine mounted on the machine.

A still further object is to provide a rotary hoe that can be easily manipulated and worked in confined spaces, and is sufficiently light to be lifted bodily by the operator for any desired purpose.

Other objects of the invention will transpire from the following description of the invention.

According to this invention, a rotary hoe comprises a control beam mounted on a supporting wheel or wheels, a transverse rotor provided with earth-working tools at one end of said control beam; one or more driving wheels driven from the rotor shaft and supported in a frame that can be pivoted about the rotor shaft axis to vary the depth of operation, means for retaining the driving wheels at an adjusted depth-control setting, and a power plant by which the driving wheels and rotor are driven.

The upper end of the control beam may be provided with handle-bars to facilitate manipulation, the handle bars may be provided with means for adjusting both vertically and laterally and a hood is preferably provided to prevent the rotor from throwing earth on to the power plant and the operator.

The supporting wheel or wheels, is preferably attached to the control beam in such a manner that it can be raised or lowered when the depth control setting of the driving wheel or wheels is changed so as to enable the control beam to be maintained at a convenient angle for operating the machine. The supporting wheel or wheels may also be employed for wheeling the machine from place to place with the rotor and driving wheel or wheels clear of the ground.

One embodiment of the rotary hoe according to this invention particularly adapted for use in glass houses, comprises a hollow control beam formed in three co-axial parts. The upper part is provided with a pair of handle-bars at the top, and is secured co-axially to an electric motor at its lower end. The centre portion of the control beam is secured to the opposite side of the electric motor and receives the projecting end of the motor shaft; it also contains the upper end of a co-axial rotor drive shaft and means for detachably coupling the two shafts together. The bottom portion of the control beam is secured co-axially to the centre portion at the top and to a gear casing at the bottom. The rotor drive shaft extends through the bottom portion of the control beam into the gear casing, and carries a worm on its lower end which engages with a worm wheel on the transverse shaft of the rotor.

The ends of the aforesaid transverse shaft project from the gear casing and are provided with coned portions and screwed extremities. A flanged disc is held on each of the coned portions by a long nut on each screwed extremity, and each disc carries two pairs of oppositely directed L-shaped earth-working tools bolted to it; the arrangement being such that the outwardly and inwardly directed tools till a swathe of the aggregate width of the rotor. A driving wheel shaft is screwed into an outer unoccupied portion of each of the aforesaid long nuts, and is locked to it, and consequently to the transverse shaft, by a lock-nut. A support frame is journalled on each of the driving wheel drive shafts, and carries a driving wheel on a stub shaft disposed forwardly of said drive shafts. The driving wheels have peripheral projections for gripping the ground and are provided with an internal gear ring engaged by pinions held on the driving wheel drive shaft by nuts. In this way the driving wheels and the rotor are driven in the same sense

[*Price* 1/-]

but at different speeds, the former being much slower.

Two levers fixed to the support frames for the driving wheels project upwards and are connected by a cross-bar to which is pivoted a connecting rod secured by adjustable means to a sleeve on the upper control beam. This rod is adapted to be slid backwards or forwards, and thus to turn both driving wheel support frames about the axis of the transverse shape, so as to adjust the depth of operation of the rotor. The connecting rod is locked in an adjusted position by a spring pawl engaging notches in the rod or in any other suitable manner.

A second pair of levers pivoted beneath the centre portion of the control beam have bearings at their free ends for an axle carrying a supporting wheel or wheels, and a further lever journalled on said axle is pivoted to a sleeve on the upper portion of the control beam. This second sleeve is adapted to be slid along the control beam and locked by a wing nut or any other suitable adjustable manner so as to adjust the angle of the control bar to a suitable working position to suit the operator.

The upper and centre portions of the control beam may be provided with flanges for bolting to the electric motor, and the similar joints are preferably made between the centre and bottom portions, and between the latter and the gear casing.

The detachable coupling between the electric motor shaft and the rotor drive shaft may comprise a sleeve pinned to the latter with a distance tube between them, and one or more keys connecting said sleeve to the motor shaft. In this way, when the centre portion of the control beam has been detached from the motor, the shafts can be disconnected, and the upper portion of the control beam with the motor can be used for another purpose.

The rotor drive shaft may be supported on ball bearings at two points within the gear casing so as to preserve its alignment and to absorb the thrust due to the worm drive. The gear casing opposite the inner end of the rotor drive shaft may be provided with an inspection cover to give access to the gearing.

The electric motor is preferably provided with vanes to induce a draught of cooling air through it. The air is preferably drawn in at the top of the motor and discharged towards the rotor so as to reduce the risk of dust entering the motor. In some instances the air may enter through holes in the end cap, or according to the preferred method the end of one or both handle-bars may be open to the atmosphere and the handle-bars and control bar provide a duct leading air to the motor. The air inlet, whichever system is used, is preferably provided with a filter.

The machine as above described is adapted to be connected to a source of electrical supply in such a manner as to permit the machine to be used over a considerable area. For this purpose the motor may be connected by a cable to an electric mains supply or to storage batteries on a trolley. Alternatively, a trolley provided with a generating set may be used instead of storage batteries. A still further method of supplying electric power to the machine is to provide a nusery garden, for instance, with overhead conducting wires, and to furnish the machine with a trolley arm for picking up the supply from the wires.

According to a modified construction of the rotary hoe, the electric motor is replaced by a small petrol motor with associated equipment—including any necessary gearing.

It will be understood that the above details of construction have been given for the purpose of illustration and are not intended to limit the scope of the invention.

Dated this 23rd day of September, 1943.

EDGAR A. GODDIN,
Agent for the Applicants.

COMPLETE SPECIFICATION

Improvements in and relating to Portable Rotary Hoes

I, ARTHUR CLIFFORD HOWARD, of 9, Stewart Avenue, Upminster, in the County of Essex, a British Subject, and ROTARY HOES LIMITED, a British Company, of Station Road, East Horndon, in the County of Essex, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to rotary hoes and has for one of its objects to provide a portable power-operated machine particularly adapted for use in greenhouses.

A further object of this invention is to provide such a machine that is adapted for electrical operation from a supply main or portable generating set. An

alternative object is to provide such a machine that carries an internal combustion engine for its operation.

A still further object is to provide a rotary hoe that can be easily manipulated and worked in confined spaces, and is sufficiently light to be lifted bodily by the operator for any desired purpose.

Other objects will transpire from the following description of the invention.

According to this invention, a rotary hoe comprises a beam mounted on a supporting wheel shaft so as to be capable of being rocked about an axis thereof, a transverse rotor including earth-working tools at one end of said beam, one or more ground-engaging driving wheels supported on an axis eccentric with respect to the rotor shaft axis and capable of being turned about the latter for varying the depth of operation of the earth-working tools, means for retaining the said driving wheels at an adjusted depth-control setting, and a power plant by which the said driving wheels and rotor are driven.

The upper end of the beam may be provided with handle-bars to facilitate manipulation.

A hood is preferably provided to prevent the rotor from throwing earth on to the power plant and the operator.

The supporting wheel or wheels are preferably attached to the beam in such a manner that the beam can be raised or lowered when the depth-control setting of the driving wheel or wheels is changed so as to enable the beam to be maintained at a convenient angle for operating the machine. The supporting wheel or wheels may also be employed for wheeling the machine from place to place with the rotor and driving wheel or wheels clear of the ground.

In instances where the power plant is constituted by an electric motor, the motor is preferably provided with vanes to induce a draft of cooling air through it. The air is preferably drawn in at the top of the motor, and discharged towards the rotor so as to reduce the risk of dust entering the motor. In some instances the air may enter through holes in the end cap, or according to the preferred method, the end of one or both handlebars may be open to the atmosphere and the handlebars and beam provide a duct leading the air to the motor. The air inlet, whichever system is used, is preferably provided with a filter.

The machine when provided with an electric motor for its power plant is adapted to be connected to a source of electrical supply in such a manner as to permit the machine to be used over a considerable area.

Such a source of electrical supply may be constituted by a portable generating set or a trolley carrying storage batteries to which the motor on the machine is connected by a cable. Alternatively, an electric cable may be led from the motor to a spring-loaded winding drum that is slung in such a manner as to permit it to revolve about a diameter as well as to rotate. The inner end of the cable on the drum is then led to a power point. In use, the drum is suspended in a greenhouse or the like at the centre of the hoeing run, or a portion thereof, and the machine is worked to and fro; the drum being moved to a new point of suspension when all ground within range of the first point has been tilled. Also, means are preferably provided, or provision is made, to prevent the cable from becoming unduly twisted during the operation of the machine.

Alternatively, when the machine is particularly adapted for use in the open, say in a nursery garden, overhead conducting wires may be suitably supported on posts and the machine provided with a trolley arm for picking up the supply from the wires.

Where the power plant is constituted by an internal combustion engine, the engine with its clutch, petrol tank, other associated equipment, including, in some cases, a gear box, are mounted on the beam, and the engine and clutch controls are led to convenient positions on the handlebars. In some instances, the air intake for the engine may be led through the handlebars which may be provided with a suitable filter.

In order that the present invention may be clearly understood, it will now be more particularly described with reference to the accompanying drawings which illustrate an electrically-driven embodiment and a petrol engine-driven type. In these drawings,

Fig. 1 is a side elevation of the electrically-driven type of machine,

Fig. 2 is a plan view thereof, in part section,

Fig. 3 is a sectional plan of the driving arrangements for the rotor and driving wheels,

Fig. 4 is a detail of a lock for the depth control means

Fig. 5 is a view corresponding to the central portion of Fig. 1 but showing a petrol engine installed instead of an electric motor, and

Fig. 6 is a plan view of the cradle on which the petrol engine is mounted.

Referring to the construction illustrated by Figs. 1 to 3, the rotary hoe

comprises a hollow beam formed in three co-axial parts 1, 2, and 3 The upper part 1 is provided with a pair of handle-bars 4 at the top, and secured co-axially to an electric motor 5 at the bottom. As shown, the connection to the motor 5 is by studs passing through a flange 6, welded to the part 1, and through distance tubes 7 into threaded bosses on the motor casting.

The centre portion 2 of the beam is secured to the opposite side of the electric motor, as by a faced flange 8 and countersunk head screws (which cannot be seen), and receives the projecting end of the motor shaft 9, see Fig. 3. The portion 2 also contains the upper end of a co-axial rotor drive shaft 10, and a coupling, hereinafter described, for connecting the two shafts 9 and 10 together.

The bottom portion 3 of the beam is secured co-axially to the centre portion 2 at the top, and to a gear casing 11 at the bottom. The rotor drive shaft 10 extends through the portion 3 of the beam into the gear casing, and carries a worm 12 which engages with a worm wheel 13 on the transverse rotor shaft 14.

The ends of the shaft 14 project from the gear casing 11, and are provided with coned portions 15 and screwed extremities 16. A flanged disc 17 is held on each of the coned portions 15 by a long nut 18, and each disc carries two pairs of oppositely directed L-shaped earth-working tools 19 bolted to it. The tools 19 are of such a size that they till a swathe of approximately the aggregate width of the rotor, as can be seen from Fig. 2, and have their leading edges further from their axis of rotation than their trailing edges.

A driving wheel shaft 20 is screwed into the outer unoccupied portion of the long nuts 18, and is locked to it, and consequently to the shaft 14, by a lock-nut 21.

Suitable washers 22, which are preferably resilient, are located between the discs 17 and the nuts 18, and between the latter and the lock-nuts 21.

A support frame 23 is journalled on each of the driving wheel shafts 20, and carries a driving wheel 24 on a stub shaft 25 which is disposed forwardly of the shafts 20. The driving wheels have peripheral projections 26 for gripping the ground, and are provided with an internal gear ring 27. Each gear ring is engaged by a pinion 28 on the appropriate driving wheel shaft 20. In this way the driving wheels and the rotor are driven in the same sense but at different speeds, the former being much slower.

The frame 23 is held in position by the pinion 28, and has its periphery flanged at 29, where it is circular, so as to enter an annular groove 30 in the driving wheel 24 for the purpose of excluding dirt. The driving wheels have oil ducts 31 leading to internal oil grooves 32, and are provided with end caps 33 shaped to accommodate the heads of the stub axles 25, which axles are held in position on the support frames by threaded portions 34 and lock-nuts 35.

The detachable coupling between the electric motor shaft 9 and the shaft 10 comprises a sleeve 36 pinned to the latter, with a distance tube 37 also pinned to said shaft, between them. One or more keys 38 connect the sleeve 36 to the motor shaft 9. In this way, when the centre portion 2 of the beam has been removed from the motor, the shafts 9 and 10 can be disconnected, and the upper portion of the beam with the motor can be used for another purpose, for instance, for attachment to another size or type of rotor.

The shaft 10 is supported in ball bearings 39, 40 within the gear casing 11; the end being reduced in diameter and secured to the inner race of the bearing 40 by a lock-nut 41. In this way, the alignment of the shaft 10 is preserved, and thrust due to the worm drive absorbed. An inspection cover 42 is provided.

The portions 2 and 3 of the beam are flanged at their adjacent ends, the connection being made by screws 43, whilst the portion 3 is spigoted to the gear casing 11 and the two held together by the nut 41.

The rotary joint between the gear casing 11 and the disc 17 is covered by a dirt-excluding ring 44 secured by set-screws to the latter.

Two levers 45, see Fig. 1, fixed to the support frames 23, are connected by a cross-bar 46 on which is a long sleeve 46*a* to which one end of a connecting rod 47 with a screwed joint at 47*a*, is pivoted. The upper end of the connecting rod is offset to form a handle, and the rod passes through a locking unit 48 secured to the flange 6. A sliding pawl 49 having a shank 49*a*, see fig. 4, is carried in guides in the unit 48 and is loaded by a spring 49*b* so as to engage with teeth 50 cut in the connecting rod. By turning the rod 47 by its handle to disengage the pawl 49, it can be slid through the locking unit so as to turn the frames 23 about the axis of the shaft 14 and thus raise or depress the driving wheels 24 for the purpose of adjusting the depth of operation of the rotor.

A second pair of levers 51, pivoted to a bracket 52 secured to the central por-

tion 2 of the beam, have bearings at their ends for an axle 53 carrying a pair of supporting wheels 54. A further lever 55 journalled on said axle is pivoted to a split clamp 56 which is locked to the upper portion 1 of the beam by a wing nut 57. When the nut 57 is slackened, the split clamp can be slid along the beam so as to adjust the angle of the latter for the convenience of the operator, particularly when an adjustment of the depth control setting has been made.

A hood 58 passed over the bottom portion 3 of the beam and having an angle plate 59 by which it is secured by screws to the flange of the portion 3, serves to protect the operator and the motor 5 from flying earth. The hood 58 is also supported by a stay 60, the lower end of which is secured to the gear casing 11.

A supply cable may be led through one of the handlebars 4 and the upper portion 1 of the beam to a terminal box 74 on the top of the motor 5. A suitable starting switch 75 is mounted on the handlebars.

The electric motor 5 is preferably provided with vanes, not shown, by which a draught of cooling air is induced to flow through it. This draught preferably flows downwards towards the rotor so as to reduce the risk of dirt entering the motor, and the air supply may enter one or both handlebars, through suitable filters, not shown, and pass through the upper portion of the beam on its way to the motor.

Referring now to the construction illustrated by Figs. 5 and 6 the portion 1 of the beam has a cradle, comprising side members 76, secured to it by plates 77 and 78 which are preferably welded in position. The members 76 are L-shaped in cross-section and provide a mounting for a petrol engine, indicated at 79.

A housing 80, to which is secured a baffle 81, houses a blower which delivers a stream of cooling air on to the engine cylinder. The petrol tank 82 is mounted on the housing, and the carburettor is indicated generally at 83, the ignition device not being shown.

A clutch 84 is detachably secured to the engine crank case and to the portion 3 of the beam, the clutch controls (not shown(being led to a convenient position on the handlebars.

A single supporting wheel 54*a* is journalled on a short spindle 85 supported at the lower ends of a pair of levers 51*a* pivoted to the front of the members 76. A second pair of levers 55*a*, articulated at 86, are also pivoted to the members 76. Wing nuts are provided at the point 86 to enable alternative holes in the lower part of the lever 55*a* to be selected for adjusting their overall length. One of the levers 55*a* is extended upwards to form a handle, and the arrangement is such that by turning the handle the levers 55*a* are hinged to alter the position of the supporting wheel 54*a*, a stop 87 being provided for engagement by the handle after it has passed the pivot centre so as to lock the position of the wheel.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A rotary hoe comprising a beam mounted on a supporting wheel shaft so as to be capable of being rocked about the axis thereof; a transverse rotor including earth-working tools at one end of said beam; one or more ground-engaging wheels supported on an axis eccentric with respect to the rotor shaft axis and capable of being turned about the latter for varying the depth of operation of the earth-working tools; means for retaining the said driving wheels at an adjusted depth-control setting; and a power plant by which the rotor and the said driving wheels are driven.

2. A rotary hoe comprising an inclined beam formed in three co-axial portions and mounted on a supporting wheel shaft so as to be capable of being rocked about the axis thereof; an electric motor secured between the top and centre portions of said beam and with its shaft extending co-axially into the bottom portion; a gear casing at the foot of the said bottom portion; a transverse rotor shaft, carrying earth-working tools, supported in bearings in said gear casing; a pair of ground-engaging driving wheels supported on an axis eccentric with respect to the rotor shaft, and capable of being turned together about the latter so as to vary the depth of operation of the earth-working tools; a shaft within said bottom portion coupled to the motor shaft at the top and geared at the bottom to the rotor shaft; gearing for communicating drive from the rotor shaft to the said driving wheels; and means for retaining the said driving wheels at an adjusted depth-control setting.

3. A rotary hoe comprising an inclined beam, formed in two co-axial portions, and mounted on a supporting wheel shaft so as to be capable of being rocked about the axis thereof; an internal combustion engine, secured to a mounting on the upper portion of the beam, with its crank shaft co-axial therewith; a clutch detachably secured to said engine;

a gear casing at the foot of the said lower portion; a transverse rotor shaft, carrying earthworking tools, supported in bearings in said gear casing; a pair of ground-engagings wheels supported on an axis eccentric with respect to the rotor shaft, and capable of being turned together about the latter so as to vary the depth of operation of the earth-working tools; a shaft within said lower portion carrying the driving member of the clutch at the top and geared at the bottom to the rotor shaft; gearing for communication drive from the rotor shaft to the said driving wheels; and means for retaining the said driving wheels at an adjusted depth control setting.

4. A rotary hoe according to any of claims 1 to 3, in which the end of the beam remote from the rotor is provided with a pair of handlebars.

5. A rotary hoe according to any of claims 1 to 3, in which the eccentric supports for the ground-engaging driving wheels are provided with arms pivoted to a connecting rod whose upper end is pivoted to a sleeve that is adapted to be slid along the beam and locked in an adjusted position for the purpose of setting the depth of operation of the earth-working tools.

6. A rotary hoe according to any of claims 1 to 3, or 5, in which the supporting wheel shaft is journalled in the ends of a pair of arms pivoted to the beam, and connected by a link pivoted to a sleeve that can be slid along the beam, for the purpose of adjusting the angle of the beam to suit the operator, and locked in the adjusted position.

7. A rotary hoe according to any of claims 1 to 3, or 5, in which the supporting wheel shaft is journalled in the ends of a pair of arms pivoted to the beam, and connected by a pair of articulated arms, of adjustable length, to pivots in a higher position on said beam; a handle is formed on one of said articulated arms so that when it is turned the position of the supporting wheel shaft is adjusted; and a stop is provided for engagement by one of the articulated arms to hold the wheels in their most depressed position.

8. A rotary hoe according to claim 2 in which the electric motor is provided with vanes for producing a draught of cooling air which is directed downwards so as also to protect the motor from dust ascending from the rotor.

9. A rotary hoe according to claim 8 in which air for the cooling draught enters the end of the handlebars, through a filter, and passes through the beam on its way to the motor.

10. A rotary hoe according to either of claims 2 or 3 in which each driving wheel is journalled on a stub axle held in a casing journalled on a detachable co-axial extension of the rotor shaft, and a pinion on said extension meshes with an internal gear on said driving wheel.

11. A rotary hoe according to any of claims 1 to 3 in which each end of the rotor shaft carries a disc upon which are mounted oppositely disposed pairs of L-shaped tools, with their leading edges further from their axis of rotation than their trailing edges, adapted to till a swathe of approximately the width of the machine.

12. A rotary hoe according to either of claims 2 or 3 in which the rotor and driving wheels are adapted to be detached from the machine for the substitution of other apparatus, by disconnecting the bottom portion of the beam, the drive shaft from the electric motor or internal combustion engine being left in position in the centre portion for connection to the substituted apparatus.

13. A rotary hoe constructed, arranged, and adapted to operate substantially as described in the specification and as illustrated by Figures 1 to 4, or by Figures 5 and 6.

Dated this 19th day of September, 1944.
EDGAR A. GODDIN,
Chartered Patent Agent,
Agent for the Applicants.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1945.

[This Drawing is a reproduction of the Original on a reduced scale.]

570,755 COMPLETE SPECIFICATION

Fig. 1.

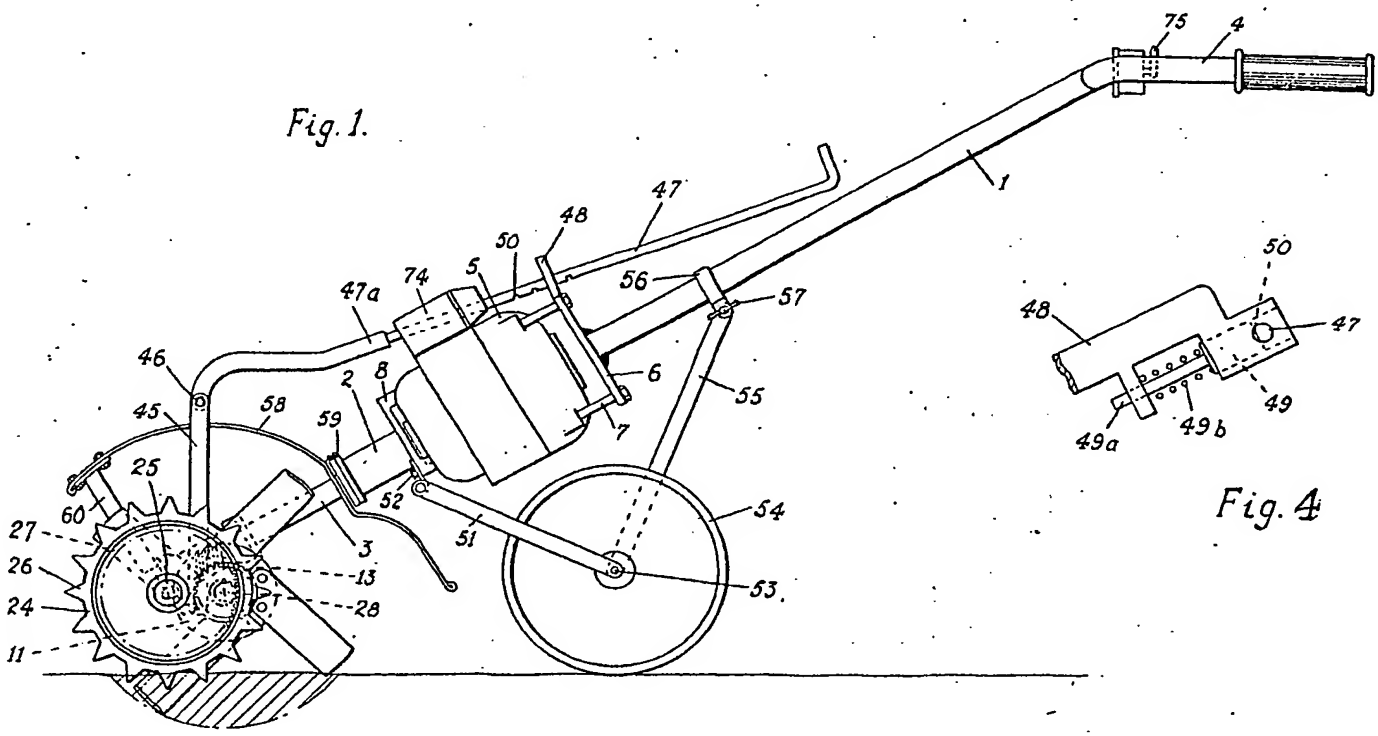
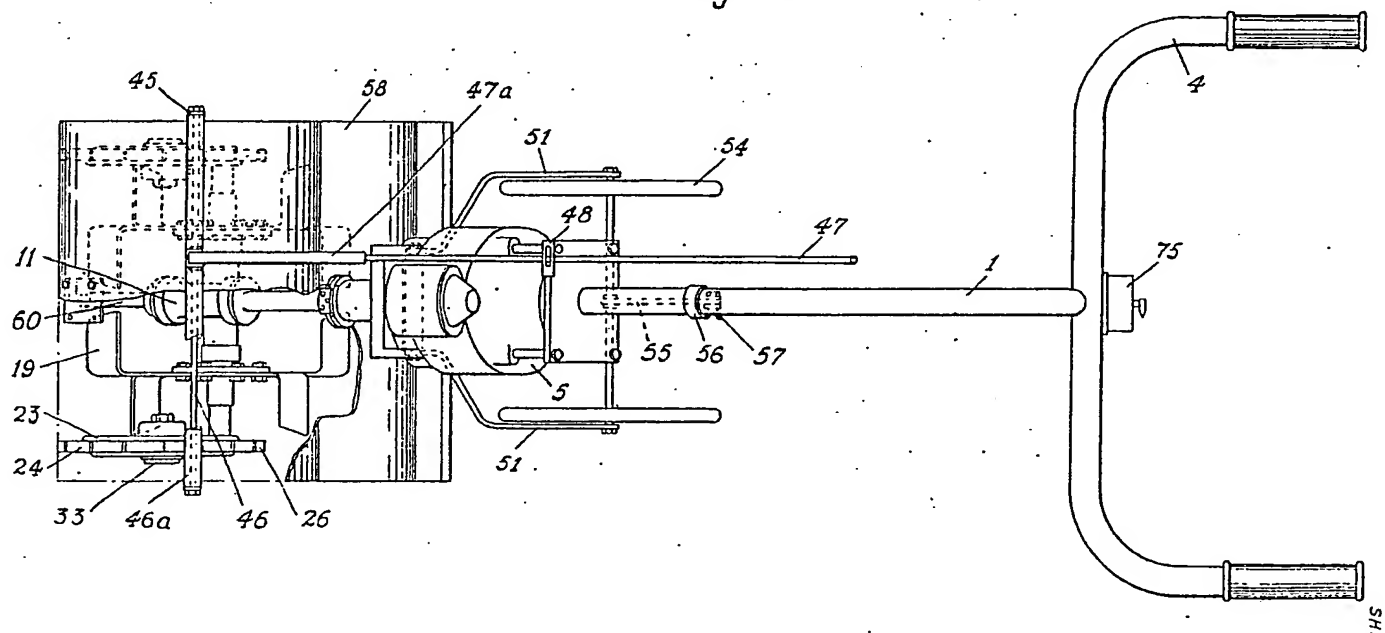


Fig. 4

SHEET 1

Fig. 2.



4 SHEETS
SHEET 2

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570,755. COMPLETE SPECIFICATION

SHEET I

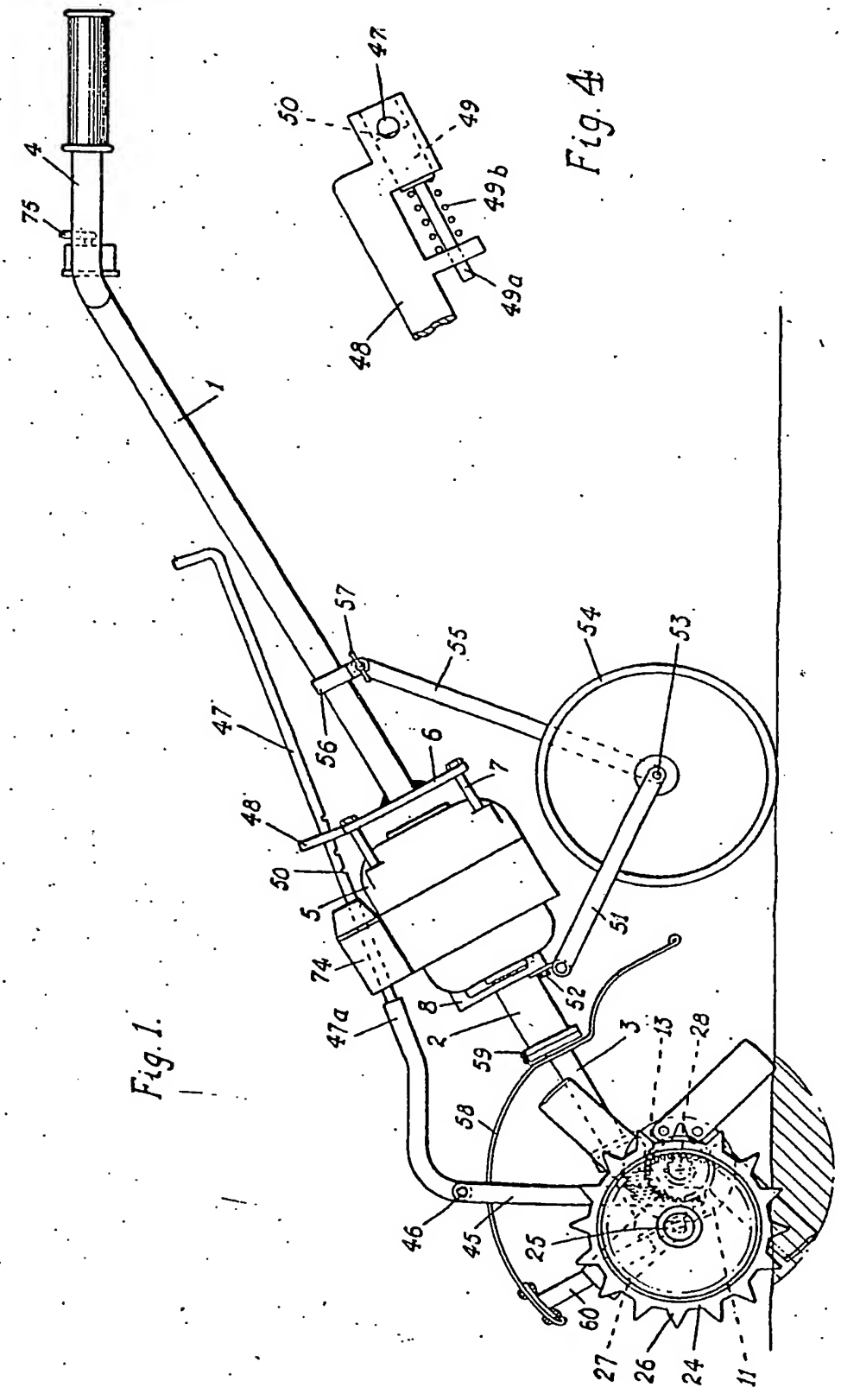

Fig. 4.

Fig. 1.

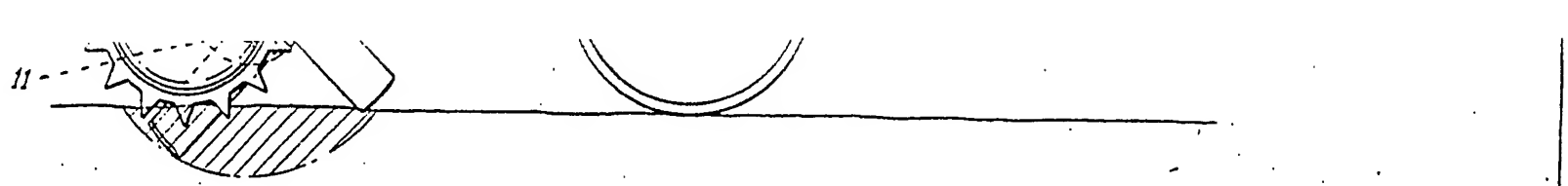

Fig. 2.

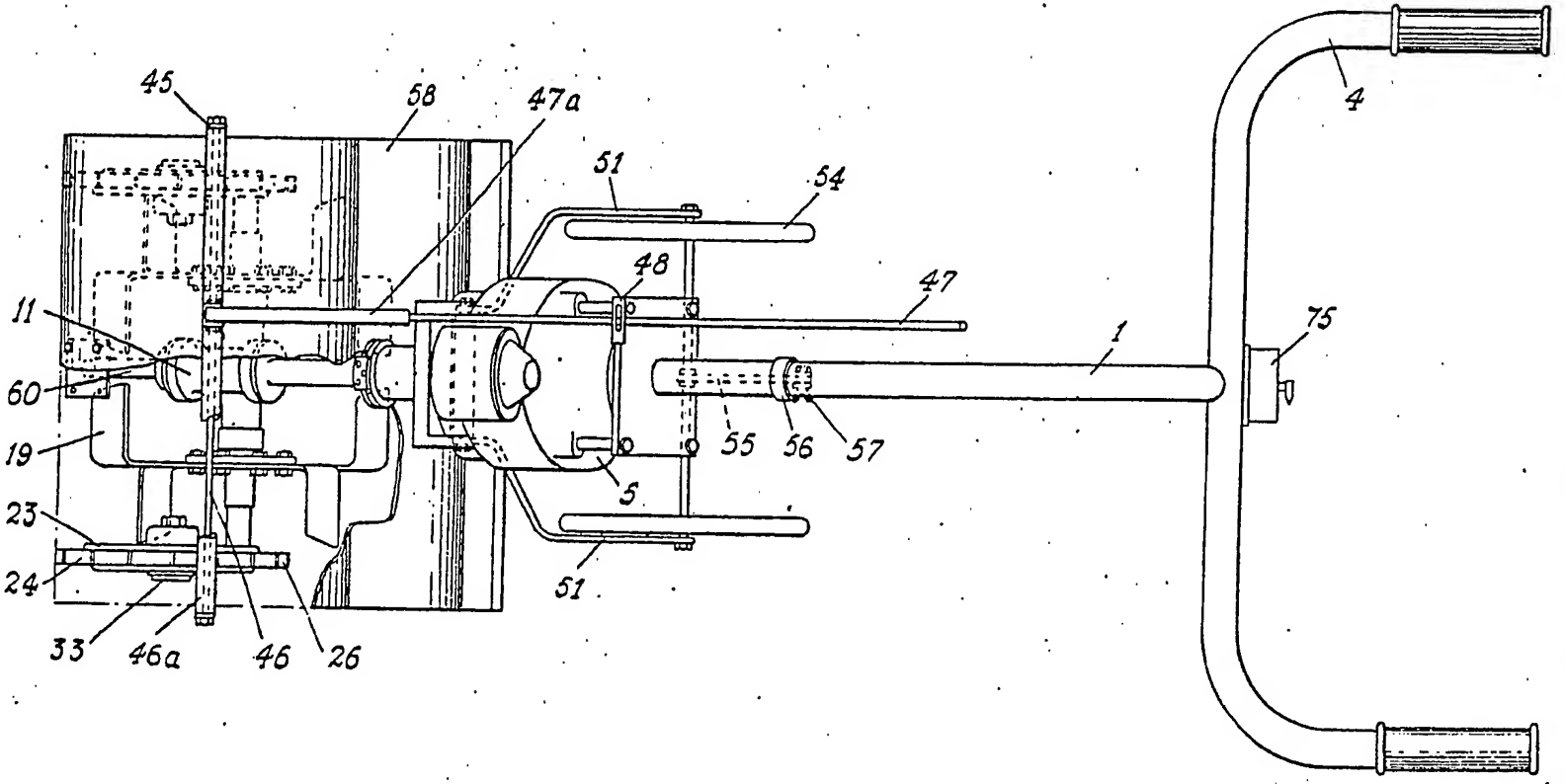

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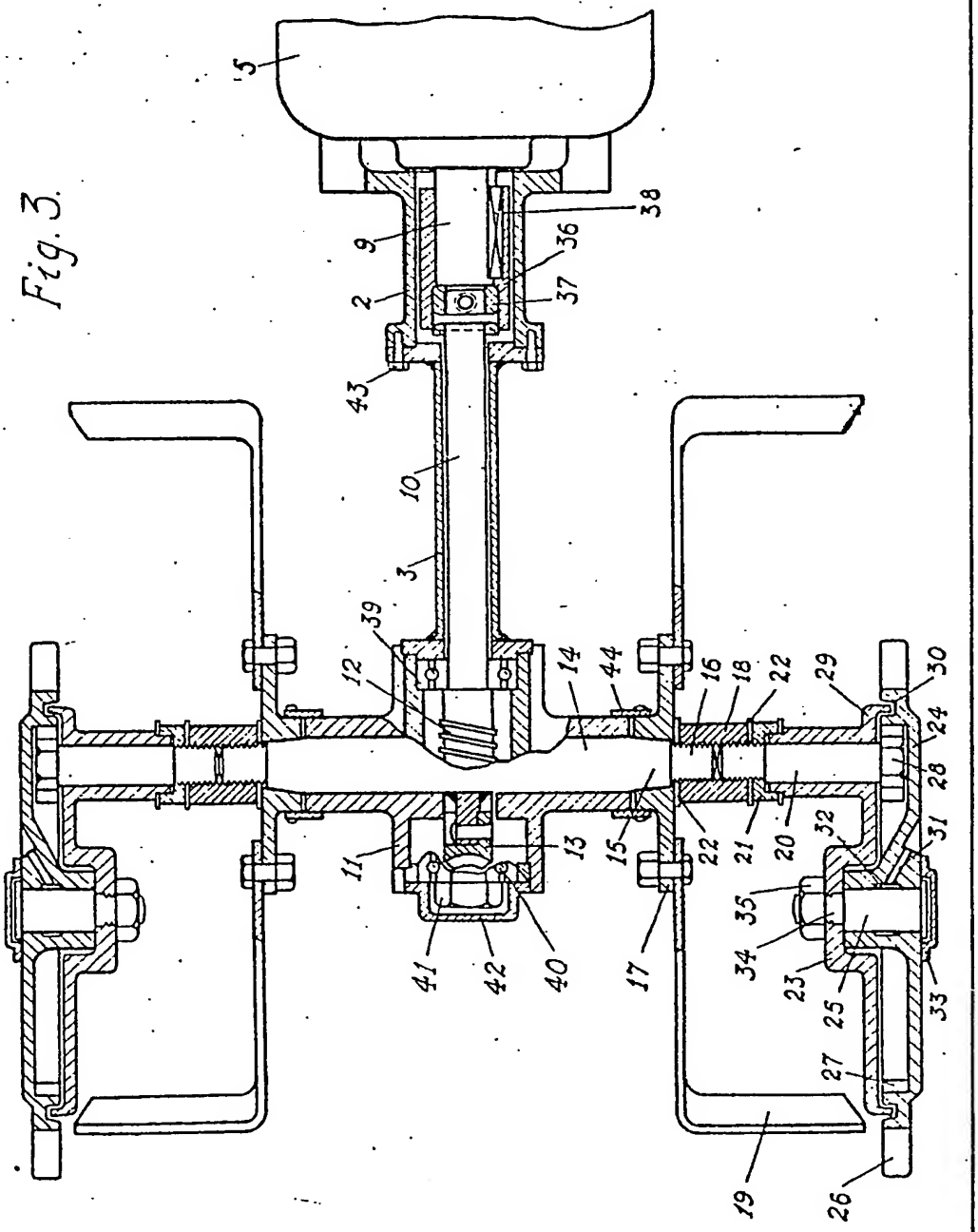
Fig. 3.



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570,755 COMPLETE SPECIFICATION

4 SHEETS
SHEET 4

Fig. 5.

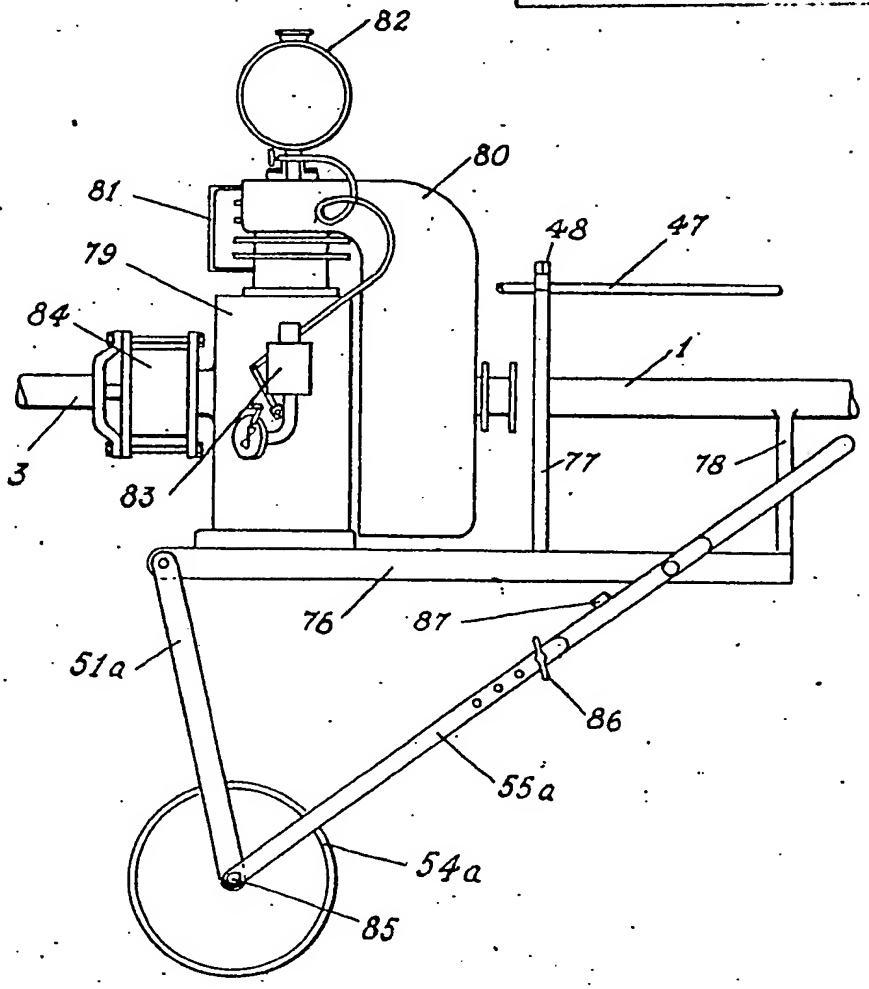
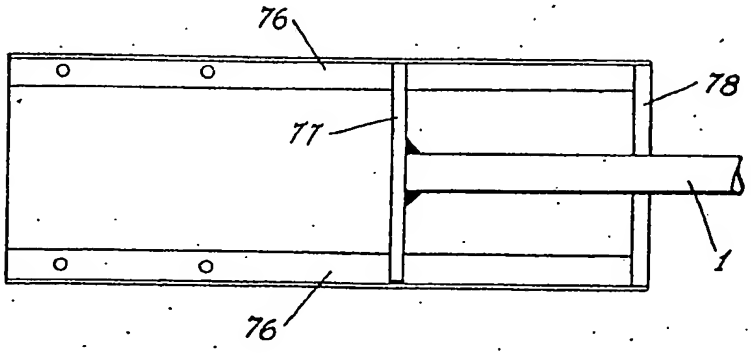


Fig. 6.



[This Drawing is a reproduction of the Original on a reduced scale.]

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Application Serial No. 10/687,884

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